

## 10-7 Solve It!



A regular polygon has a radius and so does a circle.



### Getting Ready!

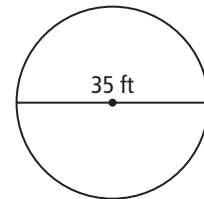
Each of the regular polygons in the table has radius 1. Use a calculator to complete the table for the perimeter and area of each polygon. Write out the first five decimal places.

| Polygon  | Number of Sides, $n$ | Length of Side, $s$  | Apothem, $a$      | Perimeter ( $P = ns$ ) | Area ( $A = \frac{1}{2}ap$ ) |
|----------|----------------------|----------------------|-------------------|------------------------|------------------------------|
| Decagon  | 10                   | $2(\sin 18^\circ)$   | $\cos 18^\circ$   | 6.18033 ...            | 2.93892 ...                  |
| 20-gon   | 20                   | $2(\sin 9^\circ)$    | $\cos 9^\circ$    | ■                      | ■                            |
| 50-gon   | 50                   | $2(\sin 3.6^\circ)$  | $\cos 3.6^\circ$  | ■                      | ■                            |
| 100-gon  | 100                  | $2(\sin 1.8^\circ)$  | $\cos 1.8^\circ$  | ■                      | ■                            |
| 1000-gon | 1000                 | $2(\sin 0.18^\circ)$ | $\cos 0.18^\circ$ | ■                      | ■                            |

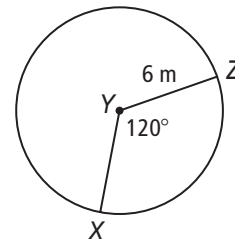
Look at the results in your table. Notice the perimeter and area of an  $n$ -gon as  $n$  gets very large. Now consider a circle with radius 1. What are the circumference and area of the circle? Explain your reasoning.

## 10-7 Lesson Quiz

1. Do you UNDERSTAND? Suppose the landing pad for a helicopter is shaped like a circle with a 35-ft diameter. What is the area of the landing pad?



2. What is the area of sector  $XYZ$ ? Leave your answer in terms of  $\pi$ .



3. Suppose  $\overline{XZ}$  is drawn in the circle from Question 2 above. What is the area of the segment between  $\overline{XZ}$  and  $\widehat{XZ}$  to the nearest tenth?

### Answers

#### Solve It!

20-gon: 6.25737... ;  
 3.09016... ; 50-gon:  
 6.27905... ; 3.13333... ;  
 100-gon: 6.28215... ;  
 3.13952... ; 1000-gon:  
 6.28317... ; 3.14157...  
 About 6.28, or  $2\pi$  units; about  
 3.14, or  $\pi$  units<sup>2</sup>; explanations

may vary. Sample: As the number of sides of a regular polygon with radius 1 increases, its shape gets closer and closer to the circumscribed circle of radius 1. The table shows that as the perimeter gets closer to 6.28, which  $\approx 2\pi$  and the area gets closer to 3.14, which  $\approx \pi$ .

#### Lesson Quiz

- about 962 ft<sup>2</sup>
- $12\pi$  m<sup>2</sup>
- 22.1